



# **Mark Scheme (Results)**

Summer 2018

Pearson Edexcel International GCSE  
In Mathematics A (4MA1) Paper 2HR

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## General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

**International GCSE Maths**

Apart from questions 4d, 17a, 17b, 18, 19, 23 (where the mark scheme states otherwise) the correct answer, unless clearly obtained from an incorrect method, should be taken to imply a correct method.

Question	Working	Answer	Mark	Notes
<b>1</b>	eg $\frac{x+10+y}{3} = 11$ oe or $y - x = 7$ oe $3 \times 11 (=33)$	$x = 8, y = 15$	2	M1 for one correct equation in $x$ and $y$ <b>OR</b> finding the total of $x$ , 10 and $y$ <b>OR</b> two numbers with a sum of 23 <b>OR</b> two numbers with a range of 7  Note: condone non-integers for the award of M1
				A1
				<b>Total 2 marks</b>
<b>2</b>	(area =) $2 \times 1.25 (=2.5)$	105	3	M1
	( $F =$ ) $42 \times "2.5"$ or $42 = \frac{F}{"2.5"}$			M1 Correct substitution into pressure formula
				A1 cao
				<b>Total 3 marks</b>

Question	Working	Answer	Mark	Notes
<b>3</b>	eg $(6.3 \times 1000) \div 210 (= 30)$	343.2(0)	4	M1 for a method to find the number of candles, could work in grams or kg
	$\frac{2}{5} \times "30" \times 13 (= 156)$			M1 for a method to find money made from the \$13 candles
	$\left(1 - \frac{2}{5}\right) \times "30" \times 0.8 \times 13 (= 187.20)$			M1 for a method to find money made from the reduced candles
				A1
				<b>Total 4 marks</b>

<b>4</b>	(a)	$3c - 21 + 6c + 8$	$9c - 13$	2	M1 For 3 or 4 terms correct A1
	(b)	$x^2 - 2x + 7x - 14$	$x^2 + 5x - 14$	2	M1 For 3 correct terms or for 4 correct terms ignoring signs or for $x^2 + 5x + k$ for any non-zero value of $k$ or for $\dots + 5x - 14$ A1
	(c)		$7y(4y - 3)$	2	B2 B1 for $y(28y - 21)$ or $7(4y^2 - 3y)$ or $7y(4y + k)$ or $7y(ay - 3)$
	(d)	eg $7x - 2 = 4(3x + 1)$ oe	$-\frac{6}{5}$	3	M1 correct first step
		$7x - 12x = 4 + 2$ oe or $-2 - 4 = 12x - 7x$ oe			M1 for rearranging the $x$ terms on one side and the numerical terms on the other. ft rearranging their expansion $ax + b = cx + d$ eg $7x - 2 = 12x + 4$
					A1 oe, dep on M1
					<b>Total 9 marks</b>

Question	Working	Answer	Mark	Notes
<b>5</b>	6h 42 min = 6.7 h or $6\frac{42}{60}$ oe or 402 (mins) or 24120 (secs) <b>OR</b> 10.8(33...)(km)	4355	3	B1 for converting 6h 42min into hours or minutes or seconds <b>OR</b> finding distance travelled in 1 minute
	eg $6.7 \times 650$ or $(402 \times 650) \div 60$ or $(24120 \times 650) \div 3600$ or $6 \times 650 + 42 \times 10.8$			M1 use of $s \times t$ , allow $6.42 \times 650 (=4173)$
				A1
				<b>Total 3 marks</b>

<b>6</b>	Eg $\frac{1.5}{100} \times 20\,000$ oe or 300	OR	20 914	3	M1 for eg $\frac{1.5}{100} \times 20\,000$ oe or 300	OR M2 for $20\,000 \times 1.015^3$ or $20\,000 \times 1.015^4$ or 21 227.27..  (M1 for $20\,000 \times 1.015^2$ or 20 604.5)
	$\frac{1.5}{100} \times (20\,000 + '300') = 304.5$	$20\,000 \times 1.015^3$			M1 for completing method	
	$\frac{1.5}{100} \times (20\,000 + '300' + '304.5')$ = 20913.5675				Accept 1 + 0.015 as equivalent to 1.015 throughout	
					<b>SC:</b> If no other marks gained, award M1 for $20\,000 \times 1.045$ oe or 20900 or 900	
				A1	Answers in range 20 913– 20 914	
				<b>Total 3 marks</b>		

Question	Working	Answer	Mark	Notes
7 (a)		$5y^4$	2	B2 B1 for fully simplifying terms in x or terms in y
(b)	$h - f = 3e$ or $\frac{h}{3} = e + \frac{f}{3}$ or $\frac{h-f}{3}$	$e = \frac{h-f}{3}$	2	M1
				A1 oe, accept $e = \frac{f-h}{-3}$
				<b>Total 4 marks</b>

8	$160^2 + 200^2 (=65600)$		3	M1
	$\sqrt{160^2 + 200^2}$			M1
		256		A1 accept 256 – 256.2
				<b>Total 3 marks</b>

9	Interior angle of pentagon $(180 \times 3) \div 5 (= 108)$ oe		4	M1 or exterior angle of pentagon = $\frac{360}{5} (= 72)$
	Interior angle of octagon $(180 \times 6) \div 8 (= 135)$ oe			M1 or exterior angle of octagon = $\frac{360}{8} (= 45)$
	$(CBF =) 360 - ("108" + "135") (= 117)$			M1 $(CBF =) "72" + "45" (= 117)$
		31.5		A1
				<b>Total 4 marks</b>

Question	Working	Answer	Mark	Notes
<b>10</b>	24.3 - 16 (= 8.3)	123.6	4	M1 Forming a right angled triangle with 24.3 - 16 on one side, 8.3 may be seen on diagram
	$\tan y = \frac{12.5}{"8.3"} \text{ OR } \tan z = \frac{"8.3"}{12.5}$ <b>OR</b> $\sqrt{"8.3"}^2 + 12.5^2 (= 15.004\dots)$ <b>and</b> $\sin y = \frac{12.5}{"15.0"} \text{ or } \sin z = \frac{"8.3"}{"15.0"} \text{ or}$ $\cos y = \frac{"8.3"}{"15.0"} \text{ OR } \cos z = \frac{12.5}{"15.0"}$			M1 for a correct trig statement involving angle <i>CDE</i> or <i>DCE</i> where <i>E</i> is on the line <i>AD</i> and <i>CE</i> is perpendicular to <i>AD</i>
	$\tan^{-1}\left(\frac{12.5}{"8.3"}\right) (= 56.415\dots) \text{ or } \tan^{-1}\left(\frac{"8.3"}{12.5}\right) (= 33.584\dots)$ <b>or</b> $\sin^{-1}\left(\frac{12.5}{"15.0"}\right) (= 56.415\dots) \text{ or } \sin^{-1}\left(\frac{"8.3"}{"15.0"}\right) (= 33.584\dots)$ <b>or</b> $\cos^{-1}\left(\frac{"8.3"}{"15.0"}\right) (= 56.415\dots) \text{ or } \cos^{-1}\left(\frac{12.5}{"15.0"}\right) (= 33.584\dots)$			M1 complete method to find angle <i>CDE</i> or <i>DCE</i>
				A1 123.5 - 123.6
	<b>Total 4 marks</b>			



Question	Working	Answer	Mark	Notes
<b>11</b> (a)		$100 < m \leq 200$	1	B1
(b)		10, 46, 80, 100, 115, 120	1	B1
(c)		Correct cumulative frequency graph	2	<p>B2 fully correct cf graph – points at ends of intervals and joined with curve or line segments</p> <p>If not B2 then B1(ft from a table with only one arithmetic error)</p> <p>for 5 or 6 (ft from a table with only one arithmetic error) of their points at ends of intervals and joined with curve or line segments</p> <p><b>OR</b> for 5 or 6 points plotted correctly at ends of intervals not joined</p> <p><b>OR</b> for 5 or 6 of their points from table plotted consistently within each interval (not at upper ends of intervals) at their correct heights and joined with smooth curve or line segments</p>
(d)	eg reading of 155 and 350 stated or indicated on graph	175 – 205	2	<p>M1ft For use of 30 and 90, or 30.25 and 90.75, or ft from a cf graph provided method is shown.</p> <p>A1ft from their cf graph</p>
(e)		12 or 13	2	<p>M1 For reading off cf from money spent at £450 (108 ft)</p> <p>A1 ft from cf graph</p>
				<b>Total 8 marks</b>

Question	Working	Answer	Mark	Notes
<b>12</b>	eg (COA=) $360 - (2 \times 90 + 74)$ (=106) or (COA=) $180 - 74$ (=106) or $OAB = 90$ or $OCB = 90$	53	3	M1 Fully correct method to find COA or OAB or OCB
	"106" $\div 2$			M1
				A1 values may be seen on diagram throughout
				<b>Total 3 marks</b>
<b>13</b>	eg $m = \frac{1}{2}$ or $y = \frac{1}{2}x + c$	(-10, 0)	4	M1 for gradient = $\frac{1}{2}$
	eg $7 = \frac{1}{2} \times 4 + c$ or $y - 7 = \frac{1}{2}(x - 4)$			M1 for substituting (4,7) into an equation with gradient = $\frac{1}{2}$
	eg $\frac{1}{2}x + 5 = 0$ or $-7 = \frac{1}{2}(x - 4)$			M1 Inputting $y = 0$ into their correct equation
				A1 SC B2 for an answer of (18,0) or (0.5,0) oe or (7.5,0) oe

Question	Working	Answer	Mark	Notes
<b>14</b>	$2^7 = 4^{2x} \times 2^x$ or $128 = (2^2)^{2x} \times 2^x$	1.4	3	M1 Replacing 128 by $2^7$ or 4 by $2^2$
	$7 = 2(2x) + x$			M1
				A1 oe

<b>15</b>	(i)	19	1	B1
	(ii)	5	1	B1
	(iii)	29	1	B1
				<b>Total 3 marks</b>

Question	Working	Answer	Mark	Notes
<b>16</b>			4	M1 for $\frac{a}{8} \times \frac{b}{7} \times \frac{c}{6}$ where $a < 8, b < 7, c < 6$
	eg $P(o, o, o) = \frac{5}{8} \times \frac{4}{7} \times \frac{3}{6} \left( = \frac{60}{336} = \frac{5}{28} = 0.178(571\dots) \right)$ or $P(e, e, o) = \frac{3}{8} \times \frac{2}{7} \times \frac{5}{6} \left( = \frac{30}{336} = \frac{5}{56} = 0.0892(857\dots) \right)$			M1 for a complete method to find $P(o, o, o)$ or $P(o, e, e)$ or $P(e, o, e)$ or $P(e, e, o)$
		$\frac{25}{56}$		M1 for a complete method to find $P(o, o, o)$ <b>and</b> at least one of $P(o, e, e), P(e, o, e), P(e, e, o)$
				A1 oe $\frac{150}{336}, 0.446(428571\dots)$ SC B2 for $\frac{260}{512} \left( = \frac{65}{128} = 0.507(8125) \right), B1$ for $\frac{170}{512} \left( = \frac{85}{256} = 0.332(03125) \right)$
				<b>Total 4 marks</b>

Question	Working	Answer	Mark	Notes
17 (a)	eg $x = 0.\dot{4}\dot{3}\dot{6}$ and $100x = 43.\dot{6}\dot{3}$ or $10x = 4.\dot{3}\dot{6}$ and $1000x = 436.\dot{3}\dot{6}$	show	2	M1 eg two decimals that when subtracted give a finite decimal
	$99x = 43.2, x = \frac{43.2}{99}$ or $990x = 432, x = \frac{432}{990}$		3	A1 for completing the 'show that' arriving at given answer from correct working.
(b)				M1 for $\sqrt{20} = 2\sqrt{5}$ and $\sqrt{80} = 4\sqrt{5}$ or $\frac{\sqrt{20} + \sqrt{80}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ or $\frac{\sqrt{20} + 2\sqrt{20}}{\sqrt{3}}$
				M1dep for $\frac{6\sqrt{15}}{3}$ or $2\sqrt{15}$ or $\frac{3\sqrt{60}}{3}$ oe
		$\sqrt{60}$		A1 dep on M2, accept $a = 60$
				<b>Total 5 marks</b>

Question	Working		Answer	Mark	Notes
18	$2(2y - 3)^2 + 3y^2 = 14$ or	$2x^2 + 3\left(\frac{x+3}{2}\right)^2 = 14$		5	M1 correct first step eg substitution
	$11y^2 - 24y + 4 = 0$	$11x^2 + 18x - 29 = 0$			A1 for a correct simplified quadratic
	$(11y - 2)(y - 2) (=0)$ or $\frac{24 \pm \sqrt{(-24)^2 - 4 \times 11 \times 4}}{2 \times 11}$	$(11x + 29)(x - 1) (=0)$ or $\frac{-18 \pm \sqrt{18^2 - 4 \times 11 \times -29}}{2 \times 11}$			M1 (dep on M1) first step to solve their 3 term quadratic
	$y = \frac{2}{11}$ or $y = 2$ (need both)	$x = \frac{-29}{11}$ or $x = 1$ (need both)			A1
					A1 Dep on first M1 Must be paired correctly Must be 2 dp or better
		$x = \frac{-29}{11}, y = \frac{2}{11}$ $x = 1, y = 2$			
					<b>Total 5 marks</b>

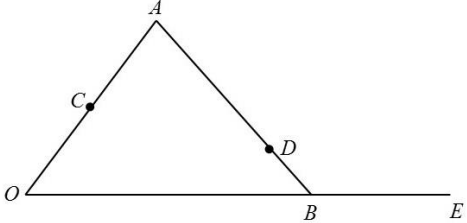
Question	Working	Answer	Mark	Notes
<b>19</b>	8.35, 8.45, 6.25, 6.35, 0.265, 0.275	8.3	3	M1 For sight of 8.35, 8.45, 6.25, 6.35, 0.265 or 0.275
	$(a =) \frac{8.45 - 6.25}{0.265}$			M1 $a = \frac{UB - LB_1}{LB_2}$ Where $8.4 < UB \leq 8.45$ and $6.25 \leq LB_1 < 6.3$ and $0.265 \leq LB_2 < 0.27$
				A1 8.3(018867...) dep on M2
				<b>Total 3 marks</b>

<b>20</b>	eg $(4x + 3)(x - 2)$ or $(x =) \frac{-(-5) \pm \sqrt{(-5)^2 - 4 \times 4 \times (-6)}}{2 \times 4}$	$x < -\frac{3}{4}$ $x > 2$	4	M 1 first step to finding the critical values
	$(x =) -\frac{3}{4}$ and 2			A 1 for two correct critical values
				M 1 (dep on two critical values having been found) for a diagram showing the inequalities <b>OR</b> $x < a$ and $x > b$ where $a$ is their lower critical value and $b$ is their upper critical value <b>OR</b> $x > 2$ <b>OR</b> $x < \frac{-3}{4}$ <b>OR</b> $\frac{-3}{4} > x > 2$
				A 1 for both correct inequalities
				<b>Total 4 marks</b>

Question	Working	Answer	Mark	Notes
21 (a)		(-2, -2), (1, 6), (4, -2) Plotted and joined	2	B2 Fully correct graph- professional judgment required.  (B1 for (1, 6) plotted <b>OR</b> (-2, -2) and (4, -2) plotted)
(b)		(2, -1), (-1, 3) (-4, -1) Plotted and joined	2	B2 Fully correct graph - professional judgment required.  (B1 for 2 of the 3 points plotted)  SC B1 for a correct reflection in the x-axis
				<b>Total 4 marks</b>

22	$\frac{(2x+5)(2x-5)}{(5x+7)(x-1)} \times \frac{2(2x-5)-3(x-3)}{(x-3)(2x-5)}$ $\frac{(2x+5)(2x-5)}{(5x+7)(x-1)} \times \frac{x-1}{(x-3)(2x-5)}$ $\frac{2x+5}{(5x+7)(x-3)}$	$\frac{2x+5}{(5x+7)(x-3)}$	4	M1 For $4x^2 - 25 = (2x + 5)(2x - 5)$ or $5x^2 + 2x - 7 = (5x + 7)(x - 1)$
				M1 $\frac{2}{x-3} - \frac{3}{2x-5} = \frac{2(2x-5)-3(x-3)}{(x-3)(2x-5)}$ oe
				M1 $\frac{(2x+5)(2x-5)}{(5x+7)(x-1)} \times \frac{x-1}{(x-3)(2x-5)}$ oe may be partially simplified
				A1 Denominator may be expanded eg $\frac{2x+5}{5x^2-8x-21}$ isw for incorrect denominator expansion
				<b>Total 4 marks</b>



Question	Working	Answer	Mark	Notes
23	 <p><math>\vec{AB} = \mathbf{b} - \mathbf{a}</math> or <math>\vec{BA} = \mathbf{a} - \mathbf{b}</math></p>	<p>Correct simplified vectors for two of <math>\vec{CD}, \vec{DE}, \vec{CE}</math> with a correct explanation</p>	5	<p>M1 Correct diagram (only points needed, condone missing vector labels) <b>OR</b> for finding <math>\vec{AB}</math> or <math>\vec{BA}</math> - may be seen as part of later working</p>
	<p><math>\vec{AD} = \frac{3}{4}(\mathbf{b} - \mathbf{a})</math> or <math>\vec{DA} = \frac{3}{4}(\mathbf{a} - \mathbf{b})</math>  or <math>\vec{DB} = \frac{1}{4}(\mathbf{b} - \mathbf{a})</math> or <math>\vec{BD} = \frac{1}{4}(\mathbf{a} - \mathbf{b})</math></p>		M1	<p>method to find <math>\vec{AD}</math> or <math>\vec{DA}</math> or <math>\vec{DB}</math> or <math>\vec{BD}</math> - may be seen as part of later working</p>
	<p><math>\vec{CD} = \frac{1}{2}\mathbf{a} + \frac{3}{4}(\mathbf{b} - \mathbf{a}) (= \frac{3}{4}\mathbf{b} - \frac{1}{4}\mathbf{a})</math>  or <math>\vec{DE} = \frac{1}{4}(\mathbf{b} - \mathbf{a}) + \frac{1}{2}\mathbf{b} (= \frac{3}{4}\mathbf{b} - \frac{1}{4}\mathbf{a})</math>  or <math>\vec{CE} = -\frac{1}{2}\mathbf{a} + \mathbf{b} + \frac{1}{2}\mathbf{b} (= \frac{3}{2}\mathbf{b} - \frac{1}{2}\mathbf{a})</math></p>		M1	<p>oe, method to find <math>\vec{CD}</math> or <math>\vec{DE}</math> or <math>\vec{CE}</math></p>
			M1	<p>A correct vector expression in terms of <math>\mathbf{a}</math> and <math>\mathbf{b}</math> for two of <math>\vec{CD}, \vec{DE}, \vec{CE}</math></p>
			A1	<p>A correct conclusion eg  <math>\vec{CD} = \vec{DE}</math> so <math>CDE</math> is a straight line  <math>\vec{CE} = 2\vec{CD}</math> so <math>CDE</math> is a straight line  <math>\vec{CE} = 2\vec{DE}</math> so <math>CDE</math> is a straight line</p>
				<b>Total 5 marks</b>

Question	Working	Answer	Mark	Notes
24 (a)		$11 - (x + 2)^2$	2	M1 For $11 - (x + q)^2$ or $p - (x + 2)^2$
				A1 fully correct, accept $p = 11, q = 2$
(b)	$(y + 3 + 2)^2 = 11$ or $11 - (y + 3 + 2)^2$	$-5 \pm \sqrt{11}$	3	M1 substituting $x = y + 3$ into their $p - (x + q)^2$
	$y + 3 + 2 = \pm \sqrt{11}$			M1
				A1 Both answers correct, ft their answer from (a) eg $-(3 + "q") \pm \sqrt{"p"}$
<b>ALT</b> (b)	<b>Alternative scheme</b>			M2 for $-y^2 - 10y - 14 = 0$ or $y^2 + 10y + 14 = 0$
		$-5 \pm \sqrt{11}$		A1 cao, both values correct
(c)		$(-1, 3)$	1	B1 cao
				<b>Total 6 marks</b>

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